

The Structures Technical Advisory Panel (STAP) assists the Structures & Geotechnical Program Steering Committee in developing a coherent, coordinated research agenda in support of Department goals, ensuring technical quality of research projects, and developing appropriate deployment paths for research products.

STATUS: #1 The University of California Davis has been selected to do this research. The research contract has been pending and was suppose to be sign at the end of June 2006. The contract continues to be pending.

#1

I – Problem Statement Title

Shortening Closure Pour Waiting Time for Bridge Construction

II – Research Problem Statement

Question: Can time savings be realized in the construction of closure pours for different bridge types, as this then translates to shorter construction periods, cost efficiencies, and reduced traffic exposure?

The waiting time for constructing a widening or joining together new staged construction has been a concern of Bridge Construction Engineers for many years. The current requirement for construction of the closure pour for all bridge types is 60 days after the falsework is released. Some bridge types may not need such a long waiting period. Research is necessary to determine how to shorten the closure pour placement waiting period for bridge construction, thus reducing construction time, minimizing public impact, and reducing exposure of the traveling public to the hazards associated with a construction zone.

III – Objective

The objective of this research is to study the effects and impacts of shortening closure pour placement waiting periods when constructing bridge widenings and staged projects requiring closure pours. Criteria will then be developed to shorten the closure pour placement waiting period based on bridge type and number of spans in the bridge.

Initially, research will focus on the predominant bridge type in the State, cast-in-place post-tensioned (CIP P/S) concrete box girder bridges for both simple span and multi-span bridges. Research may then be expanded to other bridge types assuming there is good correlation between the analytical results and the actual field testing, and it is determined that the closure pour placement waiting period can be reduced. Research will include criteria such as concrete strength and Young's modulus, and will focus on analytical

testing to predict dead load deflections from creep and concrete shrinkage. Field monitoring of bridge settlement and stresses at actual construction sites throughout the State requiring closure pours will also be performed to validate the analytical results.

The intent of the research will be to predict the dead load deflections, validate them with field monitoring, and then determine an acceptable waiting period other than 60 days in which to construct the closure pours.

IV – Background

According to Caltrans' "Bridge Memos to Designers" manual, there are two alternative time requirements for falsework release and closure pour placement when a bridge widening is constructed. These two alternatives are added as noted to Caltrans structure plans as follows:

FALSEWORK RELEASE

Alternative 1:

Falsework shall be released as soon as permitted by the specifications. Closure pour shall not be placed sooner than 60 days after the falsework has been released.

Alternative 2:

Falsework shall not be released less than 28 days after the last concrete has been placed. Closure pour shall not be placed sooner than 14 days after the falsework has been released.

When Falsework Release Alternative 2 is used, camber values are 0.75 times those shown.

As far as is known, the statement "Closure pour shall not be placed sooner than 60 days after the falsework has been released" is based mainly on past historical graphs that measure total long term deflection for CIP P/S concrete box girder bridges. These charts are very general in nature and may not be applicable to other bridge types, leading to unnecessary excessive waiting periods. These requirements are also typically applied, perhaps unnecessarily, to new staged construction to tie the different stages of construction together.

#2

STATUS: #2 The University of Reno has been selected to do this research. The research contract is pending. This contract is facing a possible cut because of a shortfall in the initial budget.

I - Problem Statement Title:

Determine the amount of inherent column cage stability for erecting bridge column cages during construction based on current fabrication practice.

II - Research Problem Statement

Question: What would be the minimum requirement for tying and/or bracing a bridge concrete column-reinforcing cage to prevent damage from racking or collapse during the construction process?

During the construction of bridge concrete columns, there is an interim time period between when the reinforcement cage is set in place and the column forming system is placed around the cage and secured. During this period, the reinforcement cage is susceptible to racking and collapse. There currently are no guidelines or specifications to control this condition.

III – Objective

STAP Roadmap Outcome: 9. Nationally Accepted Specification Advanced for Implementation in California

Develop an analysis tool and specification to accurately predict and control the properties of “tied” bridge column reinforcement cages, which would reduce the potential of failures and collapses. This would contribute to the Department’s goal of achieving the best safety record in the nation.

IV - Background

Since the advent of hoop reinforcement in lieu of spiral reinforcement we have seen a greater incident rate of column cage assemblages racking during picking and placing operations. While less frequent, spiral reinforced column cages could and would occasionally rack as well. To date, there has been no definitive research done which would give the engineer a greater understanding of the transient forces at work, the anticipated stability of bridge concrete column reinforcing cages, and provide a basis for determining a minimum number of ties and/or template reinforcement to prevent collapse.